

Appl. No. 10/768,069
Amendment dated: March 28, 2005
Reply to OA of: December 29, 2004

REMARKS

Applicants have amended the specification and claims to more particularly define the invention taking into consideration the outstanding Official Action. The specification has been amended at page 3 to include a description of figure 1h as required in the Official Action and as fully supported by the specification as originally filed.

In addition, the Abstract has been amended as required in the Official Action and is now believed to be compliant with the rules. The Abstract is submitted on a separate sheet at the end of this paper.

Applicants have also amended claim 1 as fully supported by the specification and original claims. Applicants most respectfully submit that all the claims now present in the application are in full compliance with 35 U.S.C. §112 and are clearly patentable over the references of record.

The rejection of claims 1-3 under 35 U.S.C. 112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been carefully considered but is most respectfully traversed in view of the amendment to claim 1 to provide proper antecedent basis for "the" as used in the claim and as fully supported by the specification as originally filed. Accordingly, it is most respectfully requested that this rejection be withdrawn.

The rejection of claims 1-3 under 35 U.S.C. §102(b) as being anticipated by Mei has been carefully considered but is most respectfully traversed in view of the amendment to claim 1 and the following comments.

Applicant wishes to direct the Examiner's attention to MPEP § 2131 which states that to anticipate a claim, the reference must teach every element of the claim.

Appl. No. 10/768,069
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"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed.Cir. 1990).

Akzo N.V. v. International Trade Comm'n, 808 F.2d 1471, 1 USPQ2d 1241 (Fed. Cir. 1986) (Claims to a process for making aramid fibers using a 98% solution of sulfuric acid were not anticipated by a reference which disclosed using sulfuric acid solution but which did not disclose using a 98% concentrated sulfuric acid solution.).

The captioned application relates to a method for forming a bottle shaped trench capacitor in a semiconductor device. The method of the captioned application comprises steps of providing a substrate; forming a plurality of operation layers on the substrate; forming a photoresist layer on the operation layers to define a predetermined position; forming a trench according to the predetermined position; implanting predetermined material particles (e.g. ions), which reduces oxidizing rate of the sidewall of the trench, into the upper portion of the sidewall of the trench; oxidizing the sidewall of the trench to form an oxide layer, in which the oxide layer formed at the upper portion of the sidewall implanted with the ions is thin, while the oxide layer formed at the other portion of the sidewall not implanted with the ions is thick; and removing the oxide layer to form a bottle shaped trench.

The main feature of the captioned application is that the predetermined particles (ions) are implanted into a portion of the sidewall so that oxidize ability of the portion of the sidewall implanted with the ions and the other portion of the sidewall without

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implanted ions are different. The required implanting is a claim limitation which cannot be ignore. Therefore the thicknesses of the oxide layer formed subsequently will be different in the two portions in accordance with the present invention . According to the preferred embodiment, the predetermined ions are implanted to the sidewall of the trench via tilt implantation, that is, the ions impact the sidewall with an incident angle (see Fig. 1f).

The cited reference (US Patent No. 6,232,171, refer to "the 171 patent" hereafter) discloses a method concerning bottle-shaped deep trench formation. The method includes forming a deep trench; filling the deep trench with dielectric material; etching the dielectric material down to a predetermined depth; forming a thin oxidative layer on the sidewall of the trench above the dielectric material and on top surface around the trench; forming a nitride layer covering the thin oxidative layer; using an anisotropic etching procedure to form a nitride sidewall spacer from the nitride layer; removing the dielectric material to expose the sidewall of the trench below the nitride sidewall spacer; using the nitride sidewall spacer as a mask, thermally oxidizing the portion of the substrate behind the sidewall of the trench below the nitride sidewall spacer to a predetermined penetration; removing the oxidized silicon sidewall and the nitride sidewall spacer.

The 171 patent uses the formation of the nitride sidewall spacer as a mask to oxidize the portion of the sidewall of trench below the nitride sidewall spacer. The 171 patent does not mention the feature that predetermined particles are implanted into the upper portion of the sidewall by tilt implantation, resulting in the oxidizing difference, and thereby the oxide layer subsequently formed will have different thickness in the upper and lower portions. The 171 patent does not teach the method of forming a bottle-shaped deep trench by using particle implantation to cause a difference in oxidize ability in accordance with the presently claimed invention.

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It is noted that "NH₃" mentioned in the 171 patent is a reactant for forming the nitride layer 140 and 180 in Figs. 1 and 5 rather than ions for implantation as required by the presently claimed invention.

As stated above, the 171 patent does not disclose nor even imply the key features of the captioned application, and therefore the captioned application is truly novel over the 171.

Further, the captioned application provides a simpler process for forming the bottle shaped trench as shown by its Figs. 1f to 1h, as compared to the 171 patent requiring the steps in its Figs. 3 to 9, rendering the captioned application both novel and non-obvious over the 171 patent. Accordingly, it is most respectfully requested that this rejection be withdrawn.

In view of the above comments and further amendments to the specification and claims, favorable reconsideration and allowance of all of the claims now present in the application are most respectfully requested.

Respectfully submitted,

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